CLAIMS

What is claimed is:

1   1.   A method for analyzing particle systems using polarized scattered light, said method

2   comprising the steps of:

3   providing models of multiple particle systems of dipoles;

4   performing ray-trace analysis with respect to the models over a range of scatter angles,

5   the ray-trace analysis involving only use of second-order rays;

6   receiving information corresponding to a particle system of interest; and

7   predicting at least one characteristic of the particle system of interest using information

8   generated during the ray-trace analysis.

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1   2.   The method of claim 1, wherein, in performing ray-trace analysis, constructive

2   interference of the second-order rays is considered.

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1   3.   The method of claim 1, wherein, in performing ray-trace analysis, information

2   corresponding to polarization state at near-back-scatter angles is generated for each of the

3   models.

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2   4.   The method of claim 1, wherein providing models of multiple particle systems comprises

3   the step of:

4   providing a model for each of multiple values of a separation parameter (l) for a selected

5   particle size.

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1   5.   The method of claim 1, wherein:

2   the method additionally comprises the step of:

3   providing a memory storage device; and

4   the information generated during the ray-trace analysis is stored in the memory storage

5   device.

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1   6.   The method of claim 5, wherein predicting at least one characteristic of the particle

2   system of interest comprises the steps of:

3   accessing the information stored in the memory storage device;

4   comparing the information corresponding to the particle system of interest to the

5   information accessed to determine which model most closely corresponds to the particle system

6   of interest.

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1   7.   The method of claim 6, wherein, in comparing the information corresponding to the

2   particle system of interest to the information accessed, the minimum values of polarization state

3   versus back-scatter angles are compared.

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1 8. The method of claim 1, wherein:

2 the method additionally comprises the step of:

3 detecting values of TM and TE at various back-scatter angles with respect to the

4 particle system of interest; and

5 the information received corresponds to the values of TM and TE detected.

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1 9. A method for analyzing particle systems using polarized scattered light, said method

2 comprising the steps of:

3 calculating relationships between polarization states and back-scatter angles with respect

4 to multiple arbitrary particle systems;

5 receiving information corresponding to a particle system of interest;

6 correlating the information received with the relationships calculated to determine a best

7 fit based, at least in part, on a minimum value of the polarization state of the particle system of

8 interest; and

9 using the best fit to estimate at least one characteristic of the particle system of interest.

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1 10. The method of claim 9, wherein, in calculating relationships, at least one of the multiple

2 arbitrary particle systems is a cloud of dipoles.

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1 11. The method of claim 10, wherein the cloud of dipoles is randomly distributed.

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1 12.   A computer-readable medium having a computer program stored thereon, the computer

2 program being executable to perform computer-implemented method steps, said method steps

3 comprising:

4   receiving information corresponding to a model of a distributed system of dipoles;

5   generating information corresponding to polarization state and back-scatter angle of the

6 model at multiple separation parameters (l) using second-order ray-trace analysis;

7   receiving information corresponding to a particle system of interest; and

8   predicting at least one characteristic of the particle system of interest using the

9 information generated.

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1 13.   The computer-readable medium of claim 12, wherein the method step of generating

2 information comprises the step of considering constructive interference of second-order rays.

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1 14.   The computer-readable medium of claim 12, wherein the method step of predicting at

2 least one characteristic of the particle system of interest comprises the steps of:

3   comparing the information corresponding to the particle system of interest to the

4 information generated; and

5   determining which separation parameter most closely corresponds to the particle system

6 of interest based on the comparing step.

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1 15. The computer-readable medium of claim 14, wherein the method step of comparing the

2 information corresponding to the particle system of interest to the information generated, the

3 minimum values of polarization state versus back-scatter angles are compared.

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1 16. A computer-readable medium having a computer program stored thereon, the computer

2 program being executable to perform computer-implemented method steps, said method steps

3 comprising:

4 calculating relationships between polarization states and back-scatter angles with respect

5 to multiple arbitrary particle systems;

6 receiving information corresponding to a particle system of interest;

7 correlating the information received with the relationships calculated to determine a best

8 fit based, at least in part, on a minimum value of the polarization state of the particle system of

9 interest; and

10 using the best fit to estimate at least one characteristic of the particle system of interest.

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1 17. The computer-readable medium of claim 16, wherein, in calculating relationships, at least

2 one of the multiple arbitrary particle systems is a cloud of dipoles.

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1 18. The computer-readable medium of claim 16, wherein the cloud of dipoles is randomly

2 distributed.

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1   19.   A system for analyzing a particle system using polarized scattered light comprises:

2   a model of multiple dipole particle systems, the model being configured to provide

3   information corresponding to polarization state and back-scatter angle of the multiple dipole

4   particle systems at multiple separation parameters (*l*) using second-order ray-trace analysis; and

5   a computer operative to access the model, the computer being further operative to:

6   receive information corresponding to a particle system of interest; and

7   predict at least one characteristic of the particle system of interest using the

8   information provided by the model.

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1   20.   The system of claim 19, further comprising:

2   means for storing the model such that the model is accessible by the computer.